



EMERGING PRACTICES IN INDUSTRIAL WASTEWATER TREATMENT

Abstract

Across the world, the increasing scarcity and pollution of water resources have been driving water management and waste treatment initiatives across industrial sectors. This paper studies the current trends and key initiatives underway and presents best practices that companies could follow towards better sustainability.



Using water sustainably

With freshwater resources depleting rapidly across the world, water sustainability has come to occupy the center stage in social consciousness.

Following this lead and the resulting stringent legislations, enterprises are striving towards more effective water management, and are following

several practices to meet their water sustainability targets:

Reducing withdrawals of water:

Industries operating across water-stressed areas are showing a significant focus towards reducing water withdrawal

from external sources such as ground water and municipality sources. Nestle has set itself a 2020 goal of achieving 35% reduction in direct water withdrawal in

comparison to 2010 and as of 2019 had already achieved 31% reduction. Similarly, P&G had set itself a 25% reduction target for 2018 compared to 2010 levels.¹

Increasing water reuse: Firms are focusing on recycling effluent water generated from production activities for

production or non-production purposes. For example, J&J reduced water use by 35% by reusing water as coolant

and L'Oréal uses up to 50% of treated wastewater for cleaning equipment.²

Participating in community water projects: CSR initiatives are a significant step to support global water sustainability programs. Thus, the

PepsiCo Foundation provided access to safe water to 44 million people as of 2019 and targets reaching 100 million people by 2030. In Pakistan, Nestle has installed

three water filtration units at public places.

Reducing processing unit water consumption: Industrial facilities are adopting innovative technologies, equipment, and best practices/guidelines for factory workers to reduce the

consumption of water during production processes. In 2019, PepsiCo's innovative "splash cone" technology using water sprayers to clean potatoes resulted in 64% less water consumption. In their

Ethicon facility, J&J has greatly reduced the amount of water used for sorting and cleaning of scrap needles.³

Reducing end-user water consumption: Companies are focusing on reducing their water footprint from the consumer perspective by

developing products that require less water consumption during end-use. L'Oréal has developed easier-to-use shampoos, Nestle provides consumers

with tips on efficiently using water with their products, and P&G has innovated with their washing powder and hair wash products to reduce water usage.

Monitoring wastewater treatment units using IoT- and cloud- based solutions: Wastewater treatment solution providers and technology developers are introducing IoT- and cloud-based systems for treatment plants to improve monitoring and handling efficiency with remote, continuous,

and real-time water quality monitoring features. For example, Veolia's Aquavista Digital Services, uses the cloud to enhance decision making relating to wastewater treatment. In 2019, Atonix Digital, introduced an Asset Performance Management solution to proactively manage issues and failures of treatment

plants. French start-up Aquassay's real-time data analysis solution, SAAS is helping Nestle Waters' production facilities in more than 20 countries with continuous monitoring of both water quality and consumption.⁴





Recovering resources from wastewater

Along with sustainable water use practices, several industries are also increasingly adopting wastewater treatments for recovery of resources such as biogas, nutrients, and starch.

Amongst the major wastewater treatments, zero liquid discharge (ZLD) has gained prevalence these days, especially among industrial processing units located in water scarce regions. ZLD helps in eliminating liquid waste disposal into the environment and maximizing water usage efficiency through purification and recycling of the effluent. Its key benefits include:


- Eliminating the wastewater discharge and reducing the waste-to-landfill thereby helping companies abide by environmental guidelines and the stringent water conservation legislations
- Maximizing water recovery (up to 70%–90%), that can be reused for production or non-production applications such as cleaning, sanitary use, or gardening
- Generating valuable by-products for sale or further reprocessing. For instance, sludge obtained from chemical wastewater processing can be sold to cement industries

Considering the benefits, a March 2020 World Bank report⁵ highlighted the need for industries to move from the wastewater treatment plant (WWTP) model to a water resource recovery facility (WRRF) model. Water resource recovery is increasingly becoming popular among leading companies such as Nestle, P&G, and Colgate Palmolive. The table below illustrates key application areas for recovered resources through wastewater treatment.

Industry type	Recycling technology	Resources recovered	Internal use	Sale to third party	Industry example
Food processing – Confectionery	Anaerobic technology	Methane gas (Biogas) from rejected chocolate, starch, and sugar	Energy for the site	Sold to power plants	Nestle (UK), Mars (Netherlands)
Food processing – Dairy	Anaerobic technology	Methane gas (Biogas) from milk residue	Energy for the site	Sold to power plants	Crystal Creamery (US)
Food processing – Potato-based products	Membrane Bioreactor	Starch	Production of starch-based food products	Starch processing	PepsiCo. (US)
Home care – Detergent or washing powder	Membrane Bioreactor	Surfactants	Cleaning activities	Manufacture of low-grade detergents	P&G (China, Brazil)
Personal care – Dental care	-	Residual solids	-	Raw material for the cement industry	P&G (US)

Table: Industry examples for resource recovery





Optimizing water use and wastewater treatment

While industries pursue sustainable water use and waste treatment initiatives, the processes relating to both need to be optimized so that aspects such as performance, regulatory compliance, costs, reliability, and water quality are balanced. Here are a few best practices that several companies are following as they pursue these goals:

- **Engaging with single vendors:** Firms generally engage a single vendor on a project-to-project basis to implement wastewater treatment technology for specific types of manufacturing sites across regions. For example, Nestle partnered with Veolia to implement their ZerEau technologies across all its milk processing factories worldwide including in South Africa, Mexico, India, and China.
- **Reusing water before treatment:** Manufacturers, majorly in the detergent or soap industries, use non-treated waste water — which is a detergent concentrated water — for the cleaning of their equipment and sites. This helps in reducing or eliminating the cost of wastewater treatment. Thus, L'Oréal re-uses its untreated industrial water for non-core activities such as cleaning of production equipment.
- **Implementing technology with a holistic approach:** Rather than looking to achieve 100% results in a specific operating area, companies are taking a holistic approach for a sustainable and balanced business environment. For instance, L'Oréal recently claimed that although a 100% water recycling is possible using energy-intensive technologies, it prefers a more holistic approach by using ZLD technologies that are less energy-intensive. Solution providers such as Veolia and Suez are also focused on developing energy efficient solutions.
- **Increasing stakeholder collaboration:** Collaborations and knowledge sharing with key stakeholders in the value chain — wastewater treatment solution providers, industry peers, other technology vendors, research centers, and universities — enable exploring various potential opportunities for achieving water conservation and sustainability targets. Thus, it is a common practice for companies to participate in conferences and forum to stay connected within the industry. Leading F&B companies, Mars, Coca Cola, and Nestle, participated in “*The phosphorus challenge*” program led by ESPP* at the SDF&B** conference held in January 2020. L'Oréal participated in the Corporate Water A-List Roundtables at BlueTech Forum, enabling it to leverage BlueTech insights for best practices followed across industrial sectors⁶.
- **Mapping water consumption:** Firms are using various tools to analyze, map, and identify potential functional areas where water usage can be optimized. L'Oréal uses a water scan tool that helps in categorizing water usage for functional areas such as washing, cooling, and sanitation, and identifies optimum consumption levels as benchmarks for each of these areas. Similarly, P&G has developed a tool for mapping water use in its dry laundry operations which can activate and deactivate water streams of a specific manufacturing site.
- **Creating long-term alliances:** Large firms are engaging in long-term partnerships with wastewater solution providers, seeking continuous technology developments towards increased water treatment efficiency in terms of cost and quality. In 2015, Danone and Veolia signed an innovative global strategic partnership to explore a range of innovative solutions in four major areas: water cycle management, waste management, sustainable agriculture, and energy efficiency. In 2017, SUEZ and L'Oréal signed a memorandum of understanding (MoU) for the continuous improvement of environmental performance throughout the Group's value chain, including optimizing water management, treatment, and reuse.⁷

Towards a cleaner future

When it comes to water, the world is seeing a growing paradigm shift in the management of this precious resource. Given the increasing interest in sustainable water use and focus on

wastewater management it is the right time for firms, if they have not already, to begin initiatives towards reducing waste to environment and using recycled feedstock. Apart from circular

economy principles that they stand to benefit from, the change in dynamic is likely to have an incredibly positive impact on society and the environment alike.



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